



MX06 50 MX06 100 -48 VDC POWER SYSTEMS User's Manual

(Document # 990-9131B)



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1 **Safety First!**

It is very important to follow all safety procedures when unpacking, installing and operating any sort of power equipment.

1.1. Warning Symbols

	CAUTION: An indication that special care is required to prevent injury, equipment damage or misuse
---	---

	WARNING: An indication of an electrical hazard that may cause serious personal injury or death, catastrophic equipment damage or site destruction.
---	---

1.2. General Precautions:

	WARNING: Hazardous AC voltage levels are present inside the power system. Keep the rear cover in place when the system is operational or energized
--	---

	WARNING: Hazardous energy levels are present on bare conductors in the -48VDC distribution connection area of the plant. Accidental shorting of distribution conductors can cause arcing and high currents that can cause serious burns or other physical harm. It is recommended that: • Remove any jewelry, rings or watches while working on this equipment. • Use insulated wrenches, screwdrivers, cutters, pliers and other tools.
---	---

	WARNING: Ensure that all of the DC and external AC circuit breakers are in the OFF position prior to connecting service to the power plant. Confirm that all voltages have been removed including any battery sources before proceeding.
---	---

Specific **CAUTION** and **WARNING** will be placed in manual where appropriate.

2.1. General Information

DC Power Plants from APC have unique features that make them easy to install, maintain, and upgrade. The rectifier units are modular and truly “hot-pluggable” into the shelf assembly without any separate AC wiring. The MX06 50 has 1 shelf, holding five rectifiers for a maximum of 52.5 Amps. The MX06 100 has 2 shelves, holding ten rectifiers for a maximum of 105 Amps. The controller provides monitoring and control functions for each component of the system.

The APC MX06 is a modular stand-alone -48 Volts DC power plant. It is configurable in such a manner that it will support most typical applications within the specified current ranges (10-100 Amperes) without special application engineering or assistance. DC output distribution is included for circuit breakers or GMT style fuses or in the 100 Amp versions, a combination of both. Available circuit breakers are 30 Amps or 60 Amps. GMT fuses can be 1/4 to 15 Amps. A low voltage disconnect (LVD) is provided to disconnect the battery after deep discharge. A 50 Amp power system is shown in Figure 2.1-1. A block diagram of a typical 100 Amp power system with fuses is shown in Figure 2.1-2.



Figure 2.1-1 MX06 50 DC Power Plant

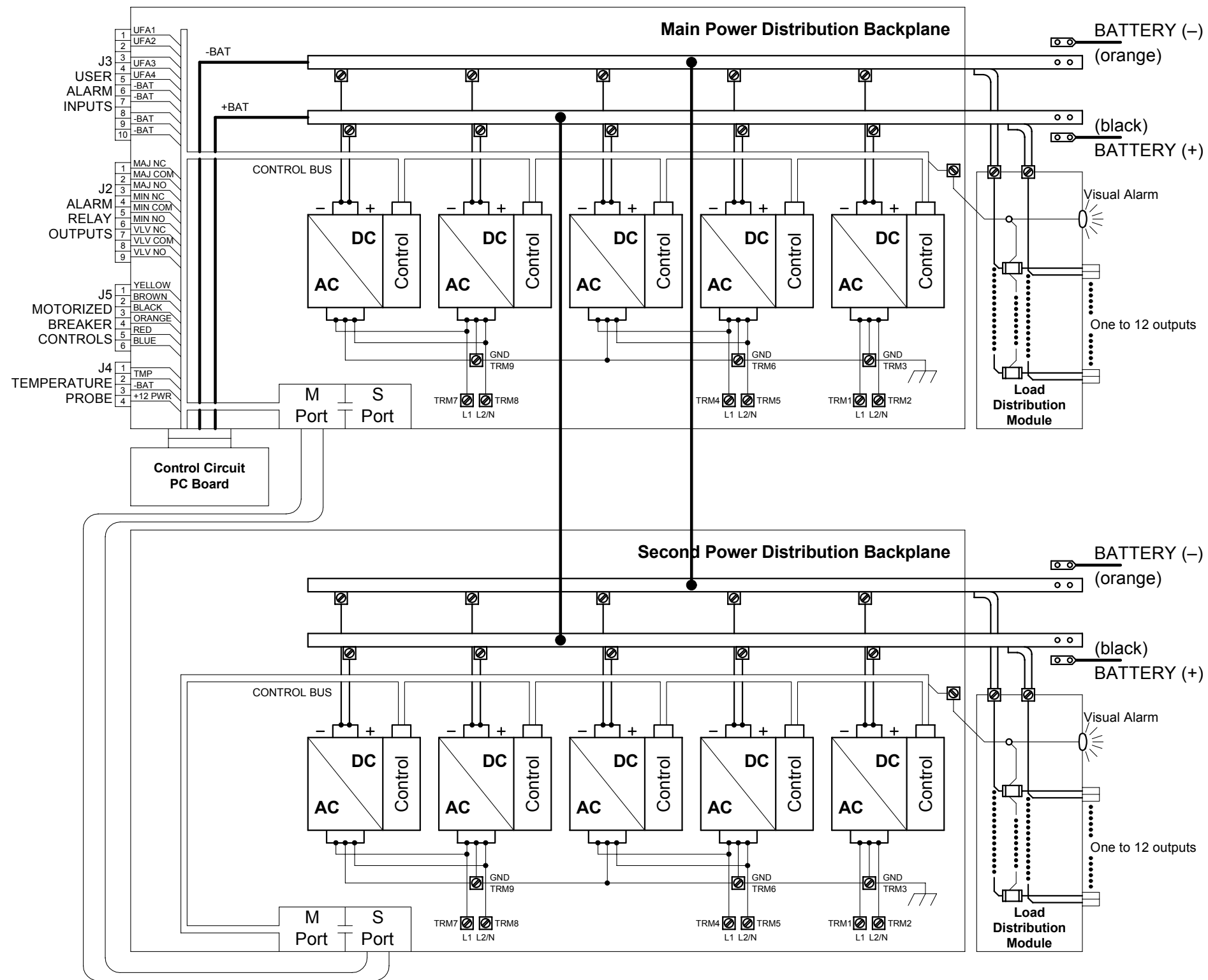


Figure 2.1-2 MX06 100 Block Diagram

2.2. How to Use This Manual

Each section of this manual can be read in any order and provides a complete explanation of the subject described by the title. However, the sequence of the sections is designed to provide a typical step-by-step process for successful use of the equipment.

<i>Safety First!</i>		Safety symbol description and general precautions.
<i>Introduction</i>		Brief system preview and explanation of manual usage.
<i>Installation</i>		How to unpack, install and commission the equipment for initial use.
<i>Operation</i>		Specifics of controls settings and indicators used to operate the unit.
<i>Technical Description</i>		Theory of operation of the power equipment.
<i>Specifications</i>		Power plant and rectifier specifications.
<i>APC Worldwide Customer Support</i>		How to contact APC for customer support.
<i>Limited Product Warranty</i>		Equipment warranty terms and conditions.

3.1. Unpacking Equipment

Remove equipment from packing material and inspect for shipping damage or missing items. It is important to report damage or material shortages to the shipping carrier while a representative is on site.

If concealed damage or material shortages are found at a later time, contact the shipper to make arrangements for inspection and claim filing. Refer to **Section 7** in the event it is necessary to return equipment to APC.



CAUTION: Appropriate lifting techniques and safety equipment should be used to remove equipment from packing.



PLEASE RECYCLE: The shipping materials can be recycled. Please save them for later use or dispose accordingly.

3.2. Mechanical Installation

Room / Location

NOTE: The APC DC power plant is to be installed in a room, vault, or similar enclosure that is accessible only to qualified persons in accordance with the regulatory authority having jurisdiction.

Prior to installation, drawings, floor loading requirements, external alarm points, AC service entrance, and grounding schemes should all be checked and confirmed. If batteries are to be mounted in a room separate from the power plant, careful attention should be paid to battery cable voltage drop effects. Environmental operating temperatures and ventilation/cooling considerations should also be noted, not just for the power system but also for all other equipment that may reside in the power room area.

Mounting

The MX06 provides brackets to mount on a standard EIA 19-inch or 23-inch rack. Install the power system using hardware designed for the rack.

Ventilation

The rectifier modules for this system have fans that provide front-to-rear airflow for internal cooling. The power system housing should be mounted such that there is free airflow to the front and back of the unit. [Refer to **Section 6.5** for environmental characteristics.] Free airflow should be ensured so that the power system can provide full power at a given ambient temperature without de-rating.

3.3. AC Power Connections



WARNING: Ensure that all of the external DC and AC circuit breakers are in the OFF position prior to connecting service to the power plant. Confirm that all voltages have been removed including any battery sources before proceeding. Keep the rear cover in place when the system is operational or energized.

The DC power system requires the supply of 90/115/208/220/240 VAC single-phase, 50/60 Hz power. One AC input on the power system backplane supplies power to the first rectifier in each shelf. Two inputs supply power to the second and third pair of rectifiers and the fourth and fifth pair in each shelf. This scheme allows a variety of wiring options. Provided the input wiring is not overloaded, one, two or all three inputs on each shelf can be jumpered together. The ambient temperature and number of wires in a conduit must be considered in accordance with all applicable regulatory agencies.

Various AC input cable kits are available from APC. These cables are 12 feet (3.7m) long and have a power plug installed on each cable. When ordered with the power system, these cables will be installed with strain reliefs provided to mount the 3-conductor jacketed cables. Each kit will supply power to the entire power system. Use the chart in Figure 3.3-1 to determine the suggested cable kits.

Part Num.	AWG	Cable Qty	Plug Num.	Plug Style	Voltage	Power System
0M-91156	12	2	NEMA 5-20P	Non-locking	115	Magnum VS 50
0M-91154	12	2	NEMA L5-20P	Locking	115	Magnum VS 50
0M-91158	10	1	NEMA 5-50P	Non-locking	115	Magnum VS 50
0M-1150	12	2	NEMA L6-20P	Locking	230	Magnum VS 50
0M-91160	10	1	NEMA 6-30P	Non-locking	230	Magnum VS 50
0M-91159	10	1	NEMA L6-30P	Locking	230	Magnum VS 50
0M-91137	12	4	NEMA 5-20P	Non-locking	115	Magnum VS 100
0M-91141	12	4	NEMA L5-20P	Locking	115	Magnum VS 100
0M-91138	10	2	NEMA 5-50P	Non-locking	115	Magnum VS 100
0M-1149	12	4	NEMA L6-20P	Locking	230	Magnum VS 100
0M-91135	10	2	NEMA 6-30P	Non-locking	230	Magnum VS 100
0M-91136	10	2	NEMA L6-30P	Locking	230	Magnum VS 100

Figure 3.3-1 AC Input Wiring Kits

3.4. Battery Connections



WARNING: Hazardous energy levels are present on bare conductors in the -48VDC distribution connection area of the plant. Accidental shorting of distribution conductors can cause arcing and high currents that can cause serious burns or other physical harm. It is recommended that:

- Remove any jewelry, rings or watches while working on this equipment.
- Use insulated wrenches, screwdrivers, cutters, pliers and other tools.

Planning the Battery installation

The battery cable(s) should be sized to limit the voltage drop from the DC power plant to the battery during charging per system design requirements. The cable(s) must also carry the full load current during battery operation. If assistance is required to determine the necessary cables for the application, contact your sales representative or APC (Refer to Chapter 7 for APC Customer Support information).

An external fuse or circuit breaker (various options are available from APC) is recommended in the negative line (located at the battery end) to protect the cables from the battery to the DC power plant. The power plant can monitor auxiliary contacts from this breaker.

Connecting the Battery Cables



WARNING: Make certain that the battery polarity is correct when making connections to the DC power plant. Incorrect connection could cause severe equipment damage.

The battery cable connections are located at the rear of the unit as shown in Figure 3.4-1. The battery positive and battery negative buses each provide a pair of #10-32 studs on 5/8" centers for connecting two-hole battery cable lugs. A ring size of 0.221 in (5.6 mm) may also be used. Connect the battery cables as applicable using #10-32 nuts. Cover all battery connections with heat shrink after assembly.

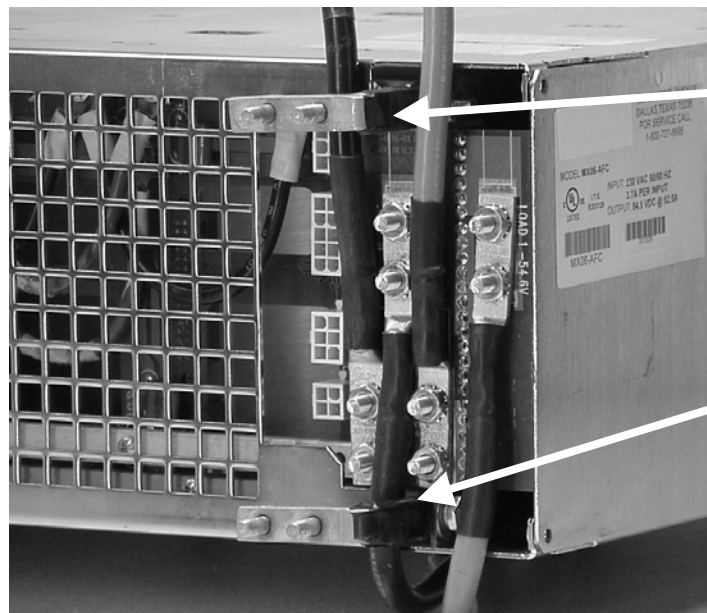


Figure 3.4-1 Battery Cable Connection Locations

Battery LVD Connection

The MX06 provides control for a motorized circuit breaker on the -48 V battery string. This motorized circuit breaker is mounted on the back of the MX06. Figure 10 shows the power, control, and monitoring connections. The motorized breaker connects in the negative battery cable.

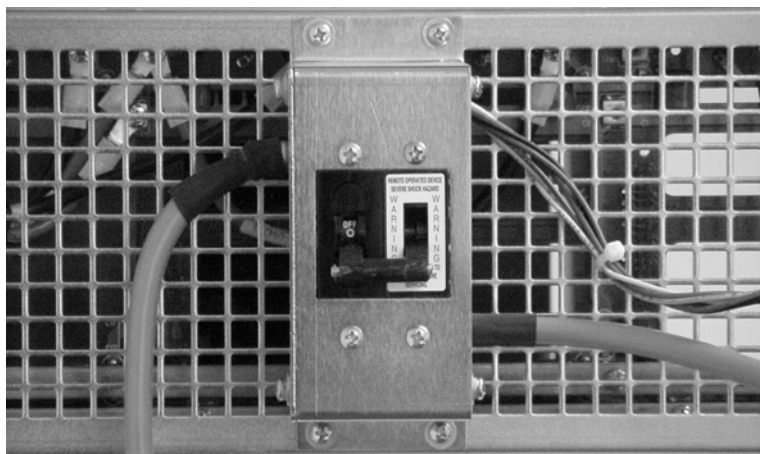


Figure 3.4-2 Motorized Circuit Breaker

Multiple Battery Strings

A number of battery strings can be connected to the MX06 using a split bus bar assembly as shown in Figure 3.4-3. Each battery tray has a provision for a manual battery disconnect. This allows service to be performed on individual strings without affecting the rest of the system.



Battery Temperature Probe Installation

The 15 Ft (4.5m) temperature probe is used to monitor the battery string temperature. To get the most representative temperature measurement, the probe should be placed in contact with a battery cell that is centrally located. The probe should be placed directly in contact with the cell (not the frame surrounding the cell). Generally, the cell cover can be used; be careful not to allow the probe body to touch the terminals. Plug the connector end of the temperature probe into J4 of the backplane card. Route the cable as required positioning the probe on the selected battery cell. Remove the adhesive protection strip from the probe body and press the adhesive side of the probe on the battery cell cover. Refer to Figure 3.4-4 for details. A 50Ft (15m) temperature probe is also available.



Figure 3.4-4 Battery Temperature Probe Installation

3.5. DC System Grounding

The positive bus for the power plant should be connected to the Central Office Ground. The Battery Return provides a pair of #10-32 studs on 5/8-inch centers for connection of a two-hole lugged cable to the Central Office Ground. A ring size of 0.221 in (5.6 mm) may also be used.

3.6. Load Protection Installation

Circuit Breaker Installation

Standard circuit breaker output boards are available with two 30 Amp breakers or one 60 Amp breaker. Output boards are installed at the factory and are not field replaceable units. Contact APC if the output configuration is not suitable for your needs. Other breaker sizes are not available.

GMT Fuse Installation

Fuse holders that accommodate GMT fuses are located on the front panel on the left side of the unit. Insert the fuse in the holder; observing the tripped indicator is correctly oriented. Use the chart shown in Figure 3.6-1 to help determine what size fuses will carry the desired current. When using several of the larger GMT fuses in one shelf, better heat dissipation will be achieved if the fuses are spaced out evenly within the output panel. A list of GMT type fuses available from APC is provided in Figure 3.6-2.

		AMBIENT TEMPERATURE		
		20° C	50° C	60° C
FUSE SIZE	7.5 Amp	5 Amp	4.5 Amp	4 Amp
	10 Amp	7 Amp	6 Amp	5 Amp
	15 Amp	10 Amp	9 Amp	8 Amp

Figure 3.6-1 GMT Fuse Temperature De-rating Chart

GMT Fuses				
FUSE RATING	PART NUMBER		FUSE RATING	PART NUMBER
¼ Amp	FFA-0030		3 Amp	FFA-0036
½ Amp	FFA-0031		5 Amp	FFA-0037
¾ Amp	FFA-0032		7½ Amp	FFA-0029
1 Amp	FFA-0033		10 Amp	FFA-0038
1¼ Amp	FFA-0039		15 Amp	FFA-0040
1½ Amp	FFA-0035			

Figure 3.6-2 GMT fuses available from APC

3.7. Load Connections

Cable Size Considerations

The DC load cable(s) should be sized to limit the voltage drop from the DC power plant to the loads per system design requirements. The cable(s) must also carry the full load current during battery operation. During battery operation the voltage will be lower and for constant power loads, the current will typically be higher. If assistance is required to determine the necessary cables for the application, contact your sales representative or APC.

Circuit Breaker Protected Load Connections (30 or 60 Amps)

The circuit breaker lug landing connection provides a pair of #10-32 studs on 5/8" centers for mounting two-hole lugs. A ring size of 0.221 in (5.6 mm) may also be used. Load Connections should be made as shown in Figure 3.7-1.

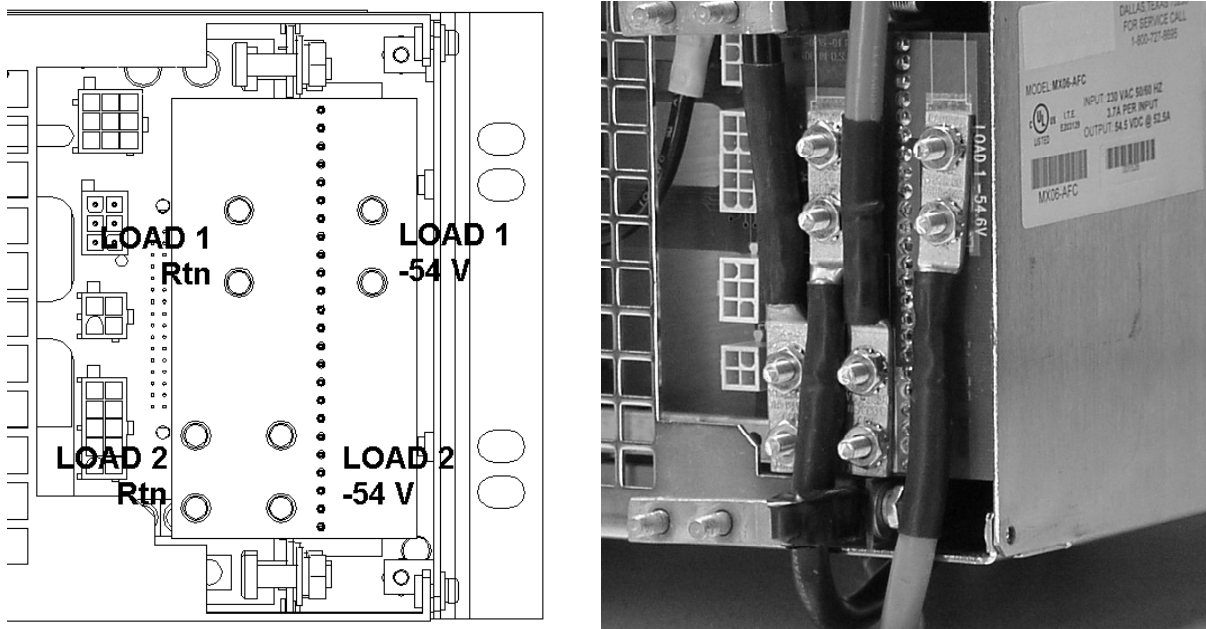


Figure 3.7-1 Connections to Circuit Breakers

GMT Fuse protected Load Connections

Connections for ¼ to 15 Amp DC loads require a ring terminal with a 0.170 in (4.3 mm) clearance hole and are located at the rear of the unit. Load Connections should be made as shown in Figure 3.7-2.

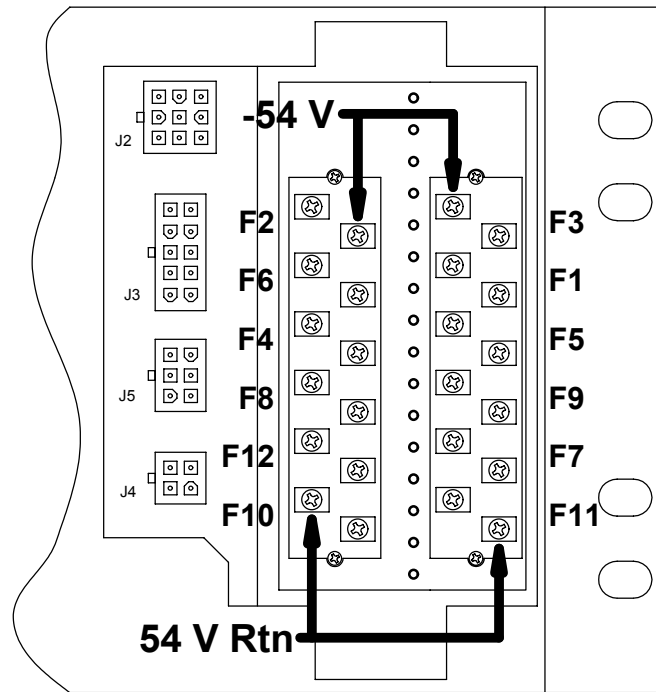


Figure 3.7-2 Connections to GMT Fuses

3.8. Input / Output Connections

Relay Output Connections

There are three output relays available that provide outputs via Form “C” relay contacts. Two of these are pre-assigned as the Minor and Major relay outputs. The other output is designated as “Very Low Voltage”. The relay contacts should only be used to switch resistive loads of 0.5 amperes or less at 60 Volts or less. Figure 3.8-1 shows the alarm output connection designations. Whenever possible use the common and normally open contacts. If the alarm wiring gets pulled loose, or the controller is removed, you will get an alarm. The output relays energize when an alarm condition occurs. A cable (0W09050) is available to connect the output relays. See Figure 3.7-2 for details.

RELAY OUTPUT		J2 CONNECTOR DESIGNATIONS	OUTPUT RELAY NOTES
MAJOR	NC	1	
	C	2	
	NO	3	
MINOR	NC	4	
	C	5	
	NO	6	
VERY LOW V	NC	7	
	C	8	
	NO	9	

Figure 3.8-1 Output Relay Connections

External Alarm Input Connections

Four user-defined alarm inputs are provided on connector J3. Each alarm input can be individually programmed for alarm priority (MAJOR or MINOR) and input contact configuration (Normally Open or Normally Closed). Each alarm input utilizes a two wire connection, with one side of the contact attached to user input pin and the other side connected to one of the –BAT pins. The input alarm contacts must be isolated (“dry”).

The factory default settings for these alarms are MAJOR alarm priority and a Normally Open (NO) contact input, closed for alarm. Changing the contact input to Normally Closed or programming an alarm condition for MINOR requires a change to dipswitch S1 mounted on the system Controller Board. See application details in Section 5.

A cable (0W09051) is available to connect the input alarms. Refer to Figure 3.7-2 for rear panel connections.

EXTERNAL ALARM INPUT	J3 CONNECTOR DESIGNATIONS	USER ALARM NOTES
#1	1	
#2	2	
#3	4	
#4	5	
#1 C	6	
#2 C	7	
#3 C	9	
#4 C	10	

Figure 3.8-2 External User Input Connections

3.9. Rectifier Module Installation



WARNING: Rectifier DC output circuits will be damaged if battery is installed incorrectly. Before rectifier installation, ensure proper battery polarity and that the battery is isolated from the rest of the system

The rectifier modules are generally shipped in separate containers. Follow the procedure below to install a rectifier module. Rectifiers may be installed even when the system is energized.

- 1) Remove the cover plate (if present) from the position where the rectifier will be added.
- 2) Remove the rectifier from its shipping container.
- 3) Slide the rectifier module into the shelf between the guides until it is fully seated.
- 4) Fasten the rectifier in place with the captive rectifier retaining screws.
- 5) Enable that rectifier position for monitoring by removing the system Controller Board and setting the dipswitch S2 position corresponding to the new rectifier position from “ON” to “OFF” (if there are 10 little switches then they operate in pairs. The rectifiers are numbered on the top row, left to right as 1 through 5; and on the bottom row, left to right 6 to 10, when facing the front of the system. See Section 5 for additional details concerning the setup of the system Controller Board.

Since all adjustments are made from the system controller, no rectifier adjustments are necessary.

3.10. Initial Power-Up and Checkout

Before initiating power-up and checkout, ensure that the following conditions exist:

- 1) Make sure that the external circuit breaker protecting the cables from the battery to the power plant are turned **OFF** (the battery cables should be connected to the power plant, but the battery should **not** be connected).
- 2) Make sure that all load circuit breakers are turned **OFF** and fuses are removed.
- 3) Verify that all rectifiers have been installed.
- 4) Apply AC Power by turning on the circuit breakers that supply AC power to the rectifiers in the power plant.

5) Use a Digital voltmeter to measure the system voltage using the "RTN" (+) and "-NEG V" (-) test points on the front panel. The voltage is set at the factory for -54.0 V dc. Use the "V ADJ" potentiometer to set the voltage to the desired level.

3.11.Battery and Load Power up

After the initial checkout has been performed, the following steps are followed to complete the system power up procedure.

- 1) Turn on the external circuit breaker from the battery to the power plant.
- 2) Load circuit protection may now be enabled as required.

4 *Technical Description*

The various MX06 models are modular stand-alone –48 V dc power plants. Each can be configured to support most typical applications within their specified current capacity without special application engineering or assistance. Output distribution is provided through the use of up to 12 plug-in GMT-type fuses per shelf or up to two circuit breakers per shelf. A control port is also available to operate an optional motorized circuit breaker designed to provide battery cable protection and low voltage disconnect (LVD) for a battery string(s).

4.1. Rectifier Management

AC Input Power

The basic component of the power system is the rectifier module, which rectifies utility AC into nominal 48 Volts DC. Each rectifier module requires 90/115/208/220/240 Volt AC single-phase, 50/60 Hz. Available cord sets include a variety of blade and twist lock plugs. Dedicated wiring inside conduit can also be used.

DC Output Power

The DC outputs of all the rectifiers in the system are connected to a common bus that is rated to carry the current of the entire system. The rectifier modules will equally share the entire load, independent of the controller. The rectifiers will continue to provide DC power if the controller is removed or fails.

System Output Capacity

The power plant has two basic configurations:

The MX06 50 power plant supplies a maximum of 52.5 amps or 42 amps with N+1 redundancy. The housing for this configuration provides one rectifier shelf with integrated DC output distribution, and controller.

The MX06-100 power plant supplies a maximum of 105 amps or 94.5 amps with N+1 redundancy. The housing for this configuration provides two rectifier shelves with integrated DC output distribution, and controller.

Rectifier alarms reporting

The rectifier has numerous sensors inside the unit that monitor AC fail, low voltage, etc. These rectifier sensors trigger outputs that are monitored by the controller. The controller can trigger output relays in the event of a rectifier alarm.

4.2. System Management

A single plug-in circuit card provides the control, display and user interface functions for the MX06. Features include the following:

Control Functions

- a) The Control Module is “hot-pluggable”.
- b) The plant voltage can be adjusted through the use of a front panel accessible potentiometer. The power plant will operate without the Control Module at a factory pre-set voltage of approximately 54.5 VDC.
- c) Automatic temperature compensation is available when a temperature probe is plugged into the rear panel.
- d) Motorized circuit breaker control, allowing for battery disconnect and reconnect at specific voltage levels.

Alarm Functions

Rectifier and plant discrete alarm points are monitored along with the plant voltage:

- e) Rectifier input healthy
- f) Rectifier output healthy (1-of-N, 2-of-N)
- g) GMT fuse trip
- h) Battery breaker trip
- i) Voltage level: High voltage, low voltage, very low voltage.
- j) User-defined alarm inputs

Displays

Front panel LEDs provide the following indications:

- k) VOLTAGE GOOD (Green): Output voltage between the low voltage and high voltage thresholds (50V dc to 57V dc).
- l) MAJOR (Red): Major alarm condition
- m) MINOR (Yellow): Minor alarm condition
- n) LOW V (Yellow): Low Voltage (50V dc)
- o) VERY LOW V (Red): Very Low Voltage. Imminent disconnect of battery if LVD in use (44V dc)

User Outputs

Alarm outputs, Form C relay contacts:

- p) Major Alarm
- q) Minor Alarm
- r) Very Low Voltage Alarm
- s) Motorized Relay control connections: Used for battery over current disconnect and battery low voltage disconnect.

User Inputs

- t) Temperature Probe: Provides input for battery voltage temperature compensation. This feature operates only when the probe is attached.
- u) User Alarm Inputs: Four inputs are provided for user alarm inputs. The inputs are designed for isolated contacts tied from the alarm input to a corresponding “-BAT” pin on the same connector. The input can be defined as “Normally Open” or “Normally Closed” through dipswitch settings on Control Board (Factory default: Normally open).

4.3. Load Management

Distribution is included for up to 2 circuit breakers or 12 GMT fuses per 50 Amp shelf. The circuit breakers can be 2 X 30 Amps or 1 X 60 Amps in each shelf. The GMT fuses are 8 X ¼ to 15 Amps in each shelf. When a circuit breaker trips, a normally open switch closes and the controller reports a CB alarm. Alarms are reported when a breaker is tripped or is manually turned off.

When a GMT fuse trips, a fuse element burns out allowing the indicator to connect DC power to the alarm contact and the controller reports a fuse alarm.

4.4. Battery Management

Battery Charging

Battery charging and protection are integrated into the DC power system to support the primary function of providing power to the load.

Battery Temperature Compensation

The Battery Float Voltage is based on the value recommended by the battery manufacturer in order to maintain correct battery charge at 25°C. As temperature rises, electrochemical activity in a battery increases. Similarly, as temperature falls, electrochemical activity in a battery decreases. As temperature rises, charging voltage should be reduced to prevent overcharge and increased as temperature falls to prevent undercharge. The DC power system uses Battery Temperature compensation to change output voltage to compensate for temperature changes.

The circuitry is designed to produce a temperature compensation slope of -3.1 mV / °C / cell, (-1.7 mV / °F / cell) which is typical for most lead acid batteries used for industrial purposes. The operational range on the compensation circuit is from about 4 °F to about 150 °F. Below 2 to 4 °F, the probe detection circuit is non-operational and the float voltage goes to the value set for 25 °C (77 °F).

Battery Low Voltage Disconnect

In order to prevent damage to the battery due to deep discharge, the DC power system has hardware support for a battery Low Voltage Disconnect (LVD). A battery LVD has the loads attached to the rectifiers and the battery is disconnected from the system. The MX06 provides control for a motorized circuit breaker on the -48 V battery string. This motorized circuit breaker is mounted on the back of the MX06. Figure 10 shows the power, control, and monitoring connections. The controller will turn the motorized breaker off in a low voltage condition to protect the battery. It can also be turned off manually as you would a non-motorized breaker. In the event of an over-current situation the breaker will trip like a normal breaker.

5.1. Description

The MX06 is designed for years of operation with no user input. The power system is pre-set at the factory with all parameters needed for normal operation. The front panel LEDs and the alarm output relays, indicate the general health of the unit.

Voltage adjustments or changes to switch settings on the system Controller Board are only required under the follow conditions:

- Rectifiers are added or removed from the original configuration shipped from the factory.
- Modifications are required to the User Alarm Input settings (alarm priority or input contact sense).
- Voltage threshold levels for alarm conditions or motorized breaker control need to be changed from the factory default settings.

5.2. MX06 Operation

The control card for the MX06-50 is different than the control card for the MX06-100 due to increased number of rectifiers in the MX06-100. The control card for the MX06 is the 0P9172 and for the MX06-100, the control card is the 0P9745. This section will deal with configurations applicable to all MX06 power systems.

MX06 Voltage Adjustments

Power plant voltage level is the only adjustment required on a standard MX06. This is performed using the “V ADJ” potentiometer on the front panel of the Control / Distribution module. The voltage level should be set to accommodate the float voltage required by the battery being used in the power system. Consult the battery manufacturer’s data sheet to get the operating voltage information.

MX06 External Alarm Input Configuration

The MX06-50 and the MX06-100 alarm input circuitry is the same for both controllers. Refer to board layouts in the preceding sections to identify switch 1. The four User Input Alarms can be programmed for either a MAJOR or MINOR alarm upon activation and can be configured for either a Normally Open (NO) or a Normally Closed (NC) input contact from the alarm source. Set dipswitch S1 to program the User Input Alarms. Refer to Figure 5.2-1 for details. The factory settings reflect normally open inputs (closed for alarm) with a MAJOR alarm priority for each user alarm.

Alarm	NO Setting	NC Setting	Major Setting	Minor Setting	Factory Setting
User 1	S1-1 Open	S1-1 Closed	S1-5 Open	S1-5 Closed	NO/Major
User 2	S1-2 Open	S1-2 Closed	S1-6 Open	S1-6 Closed	NO/Major
User 3	S1-3 Open	S1-3 Closed	S1-7 Open	S1-7 Closed	NO/Major
User 4	S1-4 Open	S1-4 Closed	S1-8 Open	S1-8 Closed	NO/Major

Figure 5.2-1 User Alarm Settings

5.3. MX06-50 Configuration Settings

The control card for the MX06-50 is different than the control card for the MX06-100 due to increased number of rectifiers in the MX06-100. The control card for the MX06 is the 0P9172 and for the MX06-100, the control card is the 0P9745. This section will deal with configurations applicable to the MX06-50 only.

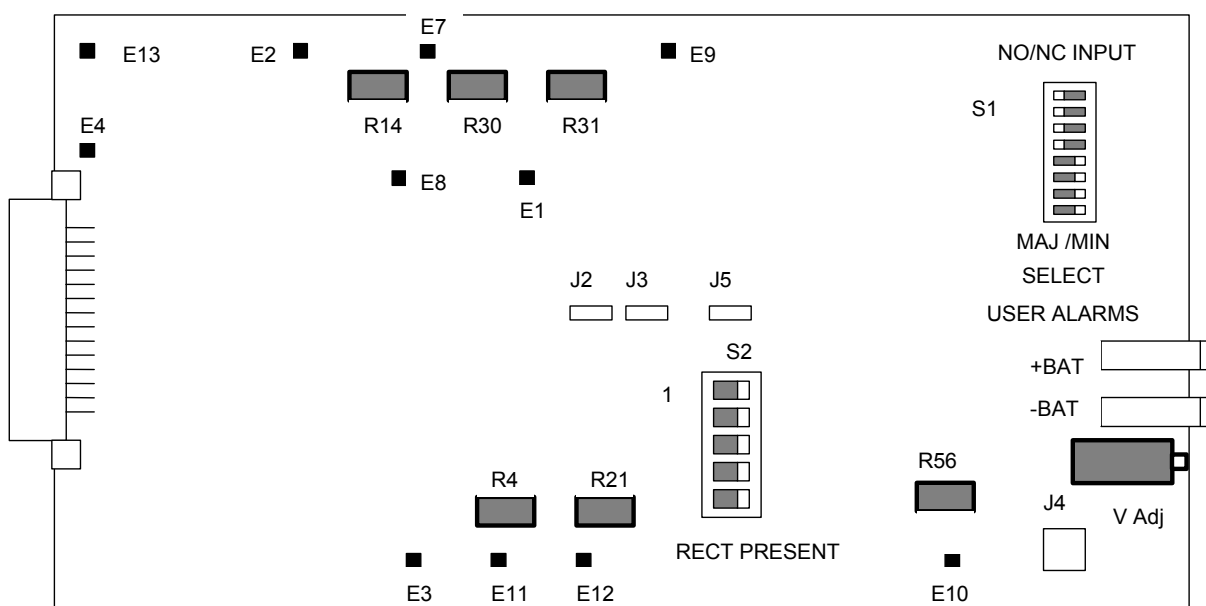


Figure 5.3-1 MX06-50 Controller Layout

MX06-50 Rectifier Configuration

The system Controller Board must know if a rectifier is present for each of the five slots. This is done by the properly setting the dipswitch S2 (“RECT PRESENT”) on the Controller Board. If a rectifier is not present in a given slot, the corresponding switch position must be set to the “ON” condition. The ON direction is labeled on the body of the dipswitch. Figure 5.3-1 locates switch S2 on the PC board.

Figure 14 shows one style of dipswitch that may be on the board. On some controller boards, dipswitch S2 may consist of 10 small switches (instead of 5 large switches). In that case the switches must be used in pairs. I.E., for rectifier 1, the top 2 are a pair, for rectifier 5, the bottom 2 are a pair, and likewise for the middle switches.

MX06-50 Programmable Alarms

The GMT alarm, battery circuit breaker alarm and the AC / Input Healthy alarm can each be programmed to either MAJOR or MINOR alarm priority. A three-pin jumper header is used for each alarm in the manner shown in Figure 5.3-2. Figure 5.3-1 locates the jumpers on the PC board. If no jumper is in place, then no alarm will be reported.



Figure 5.3-2 MX06-50 Jumper Programming.

Alarm	Jumper Designator	Major Setting	Minor Setting	No Alarm Output	Factory Setting
GMT Alarm	J5	Pins 2 and 3	Pins 1 and 2	No Jumper	Major
Battery Breaker Alarm	J3	Pins 2 and 3	Pins 1 and 2	No Jumper	Major
AC / Input Healthy	J2	Pins 2 and 3	Pins 1 and 2	No Jumper	No Alarm

Figure 5.3-3 MX06-50 Alarm Jumpers

MX06-50 Temperature Probe Selection

Temperature compensation can be configured for either a Fahrenheit or Celsius probe by the use of configuration jumpers on pin header J4 shown in Figure 5.3-1. The MX06-50 is factory set for Fahrenheit operation, with jumpers on all position of J4.

5.4. MX06-100 Configuration Settings

The control card for the MX06-50 is different than the control card for the MX06-100 due to increased number of rectifiers in the MX06-100. The control card for the MX06 is the 0P9172 and for the MX06-100, the control card is the 0P9745. This section will deal with configurations applicable to the MX06-100 only.

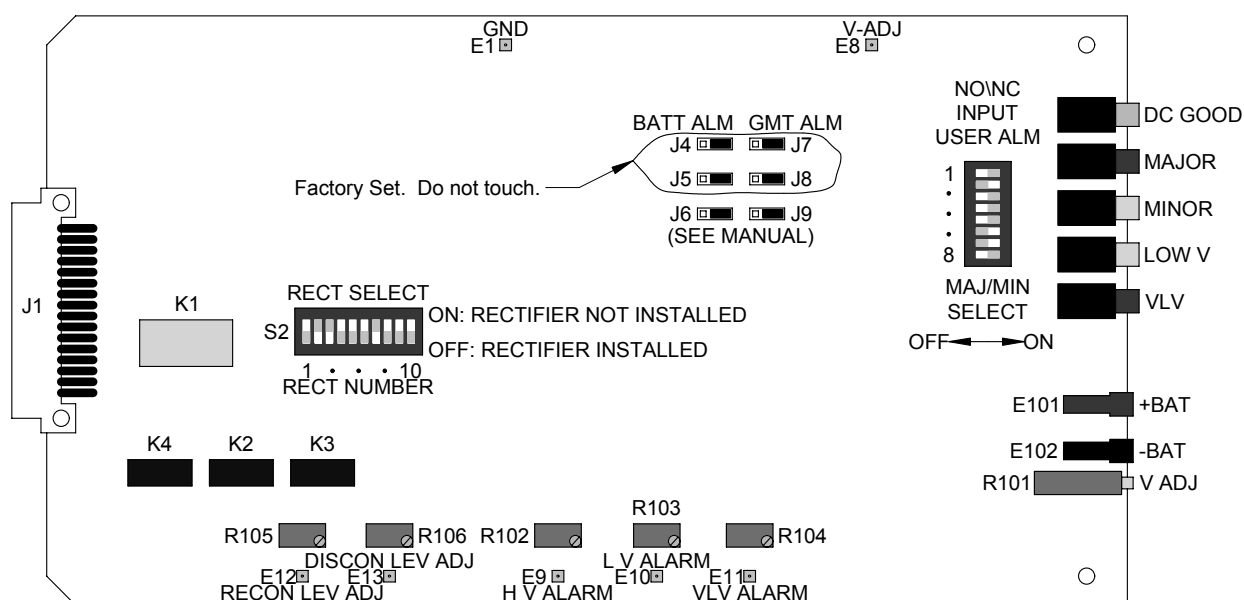


Figure 5.4-1 MX06-100 Controller Layout

MX06-100 Rectifier Configuration

The system Controller Board must know if a rectifier is present for each of the five slots. This is done by the properly setting the dipswitch S2 ("RECT PRESENT") on the Controller Board. If a rectifier is not present in a given slot, the corresponding switch position must be set to the "ON" condition. The ON direction is labeled on the body of the dipswitch. Figure 5.4-1 locates switch S2 on the PC board.

MX06-100 Programmable Alarms

The GMT alarm, and the battery circuit breaker alarm can each be programmed to either MAJOR or MINOR alarm priority. A three-pin jumper header is used for each alarm in the manner shown in Figure 13. Figure 12 locates the jumpers on the PC board. If no jumper is in place, then no alarm will be reported. Do not touch any jumpers, other than J6 and J9, as they are factory set for the configuration that you order.



Figure 5.4-2 MX06-100 Jumper Programming

Alarm	Jumper Designator	Major Setting	Minor Setting	No Alarm Output	Factory Setting
GMT Alarm	J9	Pins 2 and 3	Pins 1 and 2	No Jumper	Major
Battery Breaker Alarm	J6	Pins 2 and 3	Pins 1 and 2	No Jumper	Major

Figure 5.4-3 MX06-100 Alarm Jumpers

MX06-100 Temperature Probe Selection

Temperature compensation can be configured for either a Fahrenheit or Celsius probe by the use of configuration jumpers on pin header J3 shown in Figure 5.4-1. The MX06-100 is factory set for Fahrenheit operation, with jumpers on all position of J3.

6 Specifications

The overall system specifications can vary, depending upon the number of rectifier modules. Note that some specification items are provided on a “per rectifier” basis and must be combined or totaled for a given system configuration.

6.1. AC Input

TWF0500H5401 Rectifier

Nominal Input Voltage	90, 115, 208, 230 VAC
Input Voltage Range	85 – 264 VAC
AC Frequency Range	47 – 63 Hz
Apparent Power Factor	99% Typical, 98% Minimum
Input Current (per Rectifier)	5.5 Amps @ 115Volts AC 3.7 Amps @ 230Volts AC
Turn on Time	2 Seconds

MX06 50 Power System

Nominal Input Voltage	90, 115, 208, 230 VAC
Input Voltage Range	85 – 264 VAC
AC Frequency Range	47 – 63 Hz
Apparent Power Factor	99% Typical, 98% Minimum
Input Current	27.5 Amps @ 115 Volts AC 18.5 Amps @ 230 Volts AC

MX06 100 Power System

Nominal Input Voltage	90, 115, 208, 230 VAC
Input Voltage Range	85 – 264 VAC
AC Frequency Range	47 – 63 Hz
Apparent Power Factor	99% Typical, 98% Minimum
Input Current	55 Amps @ 115 Volts AC 37 Amps @ 230 Volts AC

6.2. DC Output

TWF0500H5401 Rectifier

Output Voltage (factory set)	54.5 VDC
Operating Voltage Range	44 – 58 VDC
Efficiency	85% Typical
Over Voltage Protection	59.5VoltsDC
Output Current per Rectifier	9.0 Amps Minimum Continuous at 115 VAC Input 10.5 Amps Minimum Continuous at 230 VAC Input.
Current Limit	9.3 Amps Maximum at 115 VAC Input 11.0 Amps Maximum at 230 VAC Input.
Power Output per Rectifier @ 54.5VoltsDC	490 W Continuous at 115 VAC Input 570 W Continuous at 230 VAC Input

MX06 50 Power System

Output Voltage (factory programmed)	54.0 VDC
Operating Voltage Range	47 – 57 VDC
Rated Output Current	52.5 A
Efficiency	85% Typical
Over Voltage Protection	59.5 Volts DC
Output Current	45 Amps Minimum Continuous at 115 VAC Input 52.5 Amps Minimum Continuous at 230 VAC Input.
Current Limit	46.5 Amps Maximum at 115 VAC Input 55.0 Amps Maximum at 230 VAC Input.
Power Output @ 54.5 VDC	2450 W Continuous at 115 VAC Input 2850 W Continuous at 230 VAC Input

MX06 100 Power System

Output Voltage (factory programmed)	54.0 VDC
Operating Voltage Range	47 – 57 VDC
Rated Output Current	10.5 A
Efficiency	91% Typical
Over Voltage Protection	59.5 Volts DC
Output Current per Rectifier	90 Amps Minimum Continuous at 115 VAC Input 105 Amps Minimum Continuous at 230 VAC Input.
Current Limit	93 Amps Maximum at 115 VAC Input 110 Amps Maximum at 230 VAC Input.
Power Output per Rectifier @ 54.5VoltsDC	4900 W Continuous at 115 VAC Input 5700 W Continuous at 230 VAC Input

6.3. Controls and Indicators

TWF0500H5401 Rectifier

FAIL LED	DC output voltage below (-) 39.5 Volts DC or above (-) 59.5 Volts DC.
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MX06 Controller

Voltage Good LED (Green)	On when voltage is between 50 and 57 Volts.
Major (Red)	On when Major Relay is energized
Minor (Yellow)	On when Minor Relay is energized
Low V LED 1 (Yellow)	On when voltage is below 50 Volts DC.
Very Low V LED (Red)	On when voltage is below 44 Volts DC.

6.4. Mechanical

TWF0500H5401 Rectifier

Dimensions	5 in (12.7 cm) high x 2-3/4 in (7cm) wide x 10.5 in (26.7 cm) deep
Weight	4 lbs (1.8 Kg)
Color	Grey Front, Yellow zinc sides and back
Mounting	Hot Swappable

Magnum VS 50 Power System

Dimensions	5-1/4 in (13.3 cm) high x 17-1/4 in (43.8 cm) wide x 12.5 in (32 cm) deep
Weight	12 lbs. (5.5 Kg)
Color	Grey Front, Yellow zinc sides and back
Mounting	19" Rack Mounting (23" Optional)

Magnum VS 100 Power System

Dimensions	10-1/2 in (26.6 cm) high x 17-1/4 in (43.8 cm) wide x 12.5 in (32 cm) deep
Weight	24 lbs. (11 Kg)
Color	Grey Front, Yellow zinc sides and back
Mounting	19" Rack Mounting (23" Optional)

6.5. Environmental

Ambient Temperature	(Operating)	-40°C to +55°C (+65°C with reduced power output)
	(Storage)	-45°C to +85°C
Humidity	(Operating)	0 – 85% RH (non-condensing)
	(Storage)	0 – 95% RH (non-condensing)
Altitude	(Operating)	3000 m (9840 ft.)
	(Storage)	10000 m (39370 ft.)

6.6. Compliance

NEBS	NEBS Level 3
Safety	UL 1950 / CE
EMC	FCC Part 15, Subpart J, Class A EN50081-1, EN50082

7 **APC Worldwide Customer Support**

Customer Support for this or any other APC product is available at no charge. You can contact APC Customer Support in any of the following ways:

- Use an APC web page to find answers to frequently asked questions (FAQs), to access documents in the APC Knowledge Base, and to submit customer support requests.
 - <http://www.apc.com>
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 - <http://www.apc.com/support/>
Submit customer support requests.
 - <http://www.apc.com/support/contact>
For e-mail addresses and local, country-specific, customer support telephone numbers worldwide.
- Contact Local or regional APC Customer Support by telephone.

US and Canada	1-(800) 800-4272	Netherlands	0800 0232509
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Belgium	0800 40677	Portugal	800 853182
Czech Republic	800 102063	Russia	8800 2002722
Denmark	80 884953	Slovak Republic	0800 172063
Finland	0800 115308	South Africa	086 1 272877
France	0805 110053	Spain	800 853182
Greece	00800 125924	Sweden	0200 895283
Hungary	0640 200262	Switzerland	0800 111469
Ireland	1890 272877	Turkey	800 2612135
Israel	1800 9452206	United Kingdom	0800 2799254
Italy	800 22091	Ukraine	8800 5027220
Luxembourg	800 22091	Worldwide	(+1) 1 401 789-5735

- Contact the APC representative or other distributor from whom you purchased your APC hardware device or APC software application for information on how to obtain local customer support.

8 *Limited Product Warranty*

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APC PRODUCTS COVERED ("Product or Products"):

MX06 50
MX06 100

Terms of Warranty:

APC warrants that the Product shall be free from defects in materials and workmanship, for a period of two (2) years from the date of shipment.

Warranty Procedure

If initial physical inspection results in identification of a material or workmanship flaw(s) that could impair Product performance as defined by APC's electrical and physical specification in effect at the time of shipment, and if this flaw(s) is not due to transportation damage or installation abuse, contact APC or call the 24-hour emergency number, (800) 800 4APC, to request assistance.

You will be provided either a) an RMA number with instructions for return of the equipment or component(s) to the APC factory service center, FOB destination, freight pre-paid, for examination, or b) for non-returnable systems and equipment, notice to wait until an APC authorized service representative arrives at the site to inspect the equipment. Repaired or advance replacement modules or circuit components will normally be available within 24 to 48 hours of receipt of equipment or RMA.

Warranty Obligations - Repair or Replacement

If, during the warranty period, the Product is found to be physically or electrically faulty due to defective materials or workmanship, the defective Product(s) or component(s) will be repaired or replaced at the sole option of APC. If the procedure outlined above for contacting APC immediately after identifying a material or workmanship flaw(s) that could impair Product performance has been properly followed, such repair or replacement of Product(s) or component(s) shall include all charges for replacement materials or repair labor. Costs incurred for replacement installation including, but not limited to, installation equipment, travel expenses of an APC representative(s), and costs of installation material transportation expenses are not included as a part of this warranty. Any replacement components or materials furnished under this warranty may be new or factory remanufactured. THIS WARRANTY DOES NOT COVER CONSUMABLES OR PREVENTATIVE MAINTENANCE ITEMS. REPAIR OR REPLACEMENT OF A DEFECTIVE PRODUCT OR COMPONENT THEREOF DOES NOT EXTEND THE ORIGINAL WARRANTY PERIOD.

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